

## Claims

- [c1] 1. An apparatus for detecting a hot rail car surface comprising:  
an infrared sensor for acquiring an infrared signal from a rail car surface of a rail car and transducing said infrared signal into an electrical signal;  
a rank filter for filtering said electrical signal to produce a filtered array;  
a first peak detector for detecting a maximum filtered value of said filtered array; and  
a first comparator for comparing said maximum filtered value to a detection threshold to produce a filtered alarm signal.
- [c2] 2. The apparatus of claim 1 wherein said rank filter has a rank of about one-half.
- [c3] 3. The apparatus of claim 1 further comprising:  
a wireless transceiver for acquiring rail car surface characteristics from a wireless tag mounted on said rail car; and  
a filter parameter calculator for calculating a filter length and rank of said rank filter as a function of said rail car surface characteristics.
- [c4] 4. The apparatus of claim 1 further comprising:  
an unfiltered signal buffer for buffering said electrical signal to produce an unfiltered array;  
a second peak detector for detecting a maximum unfiltered value of said unfiltered array;  
a second comparator for comparing said maximum unfiltered value to said detection threshold to produce an unfiltered alarm signal; and  
an alarm comparator for comparing said unfiltered alarm signal to said filtered alarm signal to produce a censored false alarm signal.
- [c5] 5. The apparatus of the previous claim wherein:  
said censored false alarm signal comprises a binary signal having a true value when said unfiltered alarm signal differs from said filtered alarm signal and a false value otherwise; and  
said apparatus further comprises a counter for counting said false values to produce a censored false alarm count.

- [c6] 6. The apparatus of the previous claim further comprising a failure isolator for diagnosing a failure mode from said censored false alarm count.
- [c7] 7. An apparatus for detecting a hot rail car surface comprising:  
an infrared sensor for acquiring an infrared signal from a rail car surface of a rail car and transducing said infrared signal into an electrical signal;  
a rank filter for filtering said electrical signal to produce a filtered array;  
a first peak detector for detecting a maximum filtered value of said filtered array;  
a first comparator for comparing said maximum filtered value to a detection threshold to produce a filtered alarm signal;  
a wireless transceiver for acquiring rail car surface characteristics from a wireless tag mounted on said rail car;  
a filter parameter calculator for calculating a filter length and rank of said rank filter as a function of said rail car surface characteristics;  
an unfiltered signal buffer for buffering said electrical signal to produce an unfiltered array;  
a second peak detector for detecting a maximum unfiltered value of said unfiltered array;  
a second comparator for comparing said maximum unfiltered value to said detection threshold to produce an unfiltered alarm signal; and  
an alarm comparator for comparing said unfiltered alarm signal to said filtered alarm signal to produce a censored false alarm signal.
- [c8] 8. The apparatus of the previous claim wherein:  
said censored false alarm signal comprises a binary signal having a true value when said unfiltered alarm signal differs from said filtered alarm signal and a false value otherwise; and  
said apparatus further comprises a counter for counting said false values to produce a censored false alarm count.
- [c9] 9. The apparatus of the previous claim further comprising a failure isolator for diagnosing a failure mode from said censored false alarm count.
- [c10] 10. A method for detecting hot rail car surfaces, the method comprising:

acquiring an infrared signal from a rail car surface of a rail car;  
transducing said infrared signal into an electrical signal;  
filtering said electrical signal using a rank filter to produce a filtered array;  
detecting a maximum filtered value of said filtered array; and  
comparing said maximum filtered value to a detection threshold to produce a  
filtered alarm signal.

[c11] 11. The method of claim 10 wherein said rank filter has a rank of about one-half.

[c12] 12. The method of claim 10 further comprising:  
acquiring rail car surface characteristics from a wireless tag mounted on said rail car; and  
calculating a filter length and rank of said rank filter as a function of said rail car surface characteristics.

[c13] 13. The method of claim 10 further comprising:  
buffering said electrical signal to produce an unfiltered array;  
detecting a maximum unfiltered value of said unfiltered array;  
comparing said maximum unfiltered value to said detection threshold to produce an unfiltered alarm signal; and  
comparing said unfiltered alarm signal to said filtered alarm signal to produce a censored false alarm signal.

[c14] 14. The method of the previous claim wherein:  
said censored false alarm signal comprises a binary signal having a true value when said unfiltered alarm signal differs from said filtered alarm signal and a false value otherwise; and  
said method further comprises counting said false values to produce a censored false alarm count.

[c15] 15. The method of the previous claim further comprising diagnosing a failure mode from said censored false alarm count.

[c16] 16. A method for detecting hot rail car surfaces, the method comprising:  
acquiring an infrared signal from a rail car surface of a rail car;

transducing said infrared signal into an electrical signal;  
filtering said electrical signal using a rank filter to produce a filtered array;  
detecting a maximum filtered value of said filtered array;  
comparing said maximum filtered value to a detection threshold to produce a filtered alarm signal;  
acquiring rail car surface characteristics from a wireless tag mounted on said rail car;  
calculating a filter length and rank of said rank filter as a function of said rail car surface characteristics;  
buffering said electrical signal to produce an unfiltered array;  
detecting a maximum unfiltered value of said unfiltered array;  
comparing said maximum unfiltered value to said detection threshold to produce an unfiltered alarm signal; and  
comparing said unfiltered alarm signal to said filtered alarm signal to produce a censored false alarm signal.

[c17]

17. The method of the previous claim wherein:  
said censored false alarm signal comprises a binary signal having a true value when said unfiltered alarm signal differs from said filtered alarm signal and a false value otherwise; and  
said method further comprises counting said false values to produce a censored false alarm count.

[c18]

18. The method of the previous claim further comprising diagnosing a failure mode from said censored false alarm count.